

# Anatoxin-a elicits an increase in peroxidase and glutathione S-transferase activity in aquatic plants

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## Introduction

Although the toxic effects of cyanotoxins on animals have been examined extensively, little research has focused on their effects on macrophytes and macroalgae. To date, only microcystins have been found to be detrimental to aquatic plants.

## Hypothesis

Anatoxin-a elicits an increase in peroxidase and glutathione S-transferase activity in aquatic plants.

## Methods

The peroxidase activity of the free floating aquatic plant *Lemna minor* and the filamentous macroalga *Chladophora fracta* was measured after exposure to several concentrations of the cyanotoxin, anatoxin-a. The effects of various concentrations of anatoxin-a on the detoxication enzyme, glutathione S-transferase (GST) in *L. minor* were also investigated.

## Results

Peroxidase activity (POD) was significantly ( $P < 0.05$ ) increased after 4 days of exposure to an anatoxin-a concentration of  $25\mu\text{g mL}^{-1}$  for both *L. minor* and *C. fracta*. Peroxidase activity was not significantly increased at test concentrations of  $15\mu\text{g mL}^{-1}$  or lower. In another experiment, the effects of various concentrations of anatoxin-a on the detoxication enzyme, glutathione S-transferase (GST) in *L. minor* were investigated. GST activity was significantly elevated at anatoxin-a concentrations of 5 and  $20\mu\text{g mL}^{-1}$ . Photosynthetic oxygen production by *L. minor* was also found to be reduced at these concentrations.

## Conclusion

This is the first report to our knowledge of the cyanotoxin anatoxin-a being harmful to aquatic plants.